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## (54) DEVICES FOR DRIVING MOBILE TROLLEYS

(71) We, I.C.M.S. LIMITED, a British Company of 41, Gayton Road, Harrow, Middlesex and BERNARD MARCUS FREIDMAN, a British Subject of 17 Danes Court, St. Edmunds Terrace, London N. W.8. do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is performed, to be particularly described in and by the following statement:—

This invention relates to driving devices and more particularly to devices for driving wheeled pallets or trolleys. Such pallets or trolleys, hereinafter generically referred to as trolleys, when loaded, are difficult to push or pull manually over existing floors and floor coverings, in particular carpets, up and down ramps, and are difficult to manoeuvre in the confined spaces which exist indoors, for example in lifts and between shopping counters.

It is an object of this invention to provide a device for driving trolleys which avoids or substantially reduces the above mentioned disadvantages.

To this end, and from one aspect, the present invention consists in a device for driving a mobile trolley, said device comprising a chassis having front and rear ends, two ground-engaging wheels carried by said chassis and rotatable about a common axis extending transversely of said chassis, said common axis being at a location which is nearer the front end of the chassis or at the transverse centre line of said chassis, steering handle means mounted on said chassis and normally projecting beyond the rear end thereof, means for coupling a mobile trolley to said chassis, means mounting said coupling means to the front end of said chassis at a location which is low to the ground, and for swivelling about a substantially vertical axis, said device having a centre of gravity which is on that side of the wheel axis which is remote from the coupling means, battery means mounted on said chassis and an electric motor connected to the battery for driving at least one of said wheels, said chassis being tiltable about the wheel axis by said handle means

in one direction to position said coupling means beneath the trolley and is then tiltable in the opposite direction under the influence of gravity to engage the said coupling means with the trolley.

By means of the invention, the driving device can be quickly coupled to the trolley merely by tilting the chassis, and since the coupling means engages beneath the trolley at a location close to the ground or floor, preferably below the wheel axis, the driving force is applied nearer the trolley wheels than is the case when the trolley is pushed or pulled manually, thereby more easily overcoming frictional forces therebetween. Thus, not only can the driving device drive trolleys over floor coverings but also up and down ramps leading to and from e.g. a storage area. Moreover, some of the weight may be taken off the trolley wheels by tilting the chassis further in the other direction.

From another aspect, the present invention consists in combination, a mobile trolley having a transverse substantially horizontal end frame member which is close to the ground, and a battery operated driving device comprising a chassis having front and rear ends, two wheels carried by said chassis and rotatable about a common axis extending transversely of said chassis, steering handle means mounted on said chassis and normally projecting beyond the rear end thereof, coupling means projecting from the front end of said chassis and engaged with the end frame member of the trolley, said device having a centre of gravity which is on that side of the wheel axis which is remote from the coupling means and thereby urging said coupling means upwardly against the trolley end frame member, battery means mounted on said chassis and an electric motor connected to the battery means for driving at least one of said wheels, said coupling means being disengagable from the trolley end frame member by lifting the handle upwardly to tilt the chassis about the wheel axis and being re-engagable with the trolley end frame member by allowing

the chassis to tilt about the wheel axis in the opposite direction under the influence of gravity.

Although, the device may be provided with means such as a suspended battery support or gimbals arrangement for maintaining the battery or batteries in a substantially vertical position with a view to preventing battery electrolyte spillage during such tilting, such means is not essential since with currently available 12 volt lead-acid car batteries electrolyte spillage is avoided up to a tilting angle of about 45°.

Preferably, the motor is reversible in order that the trolley can be pushed and pulled by the driving device so as to increase manoeuvrability.

Advantageously, the device is provided with a built-in battery charger so that the device is not being used, the device can be plugged into a mains wall socket for re-charging the battery.

In preferred embodiment of the invention, the device comprises an axle rotatable in bearings on said chassis, the wheels being fixed to the axle, a reduction gear connected to the motor, transmission means connected to the motor and a differential connected to the axle and transmission means.

The chassis may be provided with a foldable or fixed supporting leg or further wheel (non-driven) or castor so that the device can be supported with the chassis in a substantially horizontal position when not being used.

In order that the invention may be more clearly understood reference will now be made to the accompanying drawings, in which:—

Fig. 1 shows in side elevation, a trolley driving device constructed according to the invention,

Fig. 2 is a rear elevation of the device shown in Fig. 1, with the steering handle partly broken away,

Fig. 3 is a top plan view of the device shown in Fig. 2, and

Fig. 4 is a view of the device in a position for driving a trolley which is also shown.

Referring to the drawings, the driving device comprises a chassis 1, which is generally U-shaped in transverse section and has a pair of integral side flanges 1a on which a removable cover 2 which permits access to the whole chassis interior, is supported and secured as by screws or bolts (not shown) passing through holes 1b in the flanges. The chassis 1 is conveniently a folded and welded fabrication of steel plate and the cover 2 is conveniently of wood. Welded to the front and rear ends of the chassis 1 are front and rear panels 15, 16, also conveniently of steel plate, the rear panel including an instrument panel 17.

The chassis 1 carries an axle 18, which is rotatably supported in bearings such as 19 in a position which is forwards of the transverse centre line of the chassis. Two large pneumatic-tyred driving wheels 9 are fixed to the opposite ends of the axle 18 and a castor 9a depending from the rear end of the chassis base mid-way between the wheels enables the device to maintain the generally horizontal position shown in Fig. 1 when not in use. A steering handle 3, is fixed to and projects from the instrument panel 17 at the rear end of the chassis. In order to reduce the overall length of the device, the handle 3 is foldable over the top of the chassis about a hinge 20 which is normally held rigid by a slidable sleeve 21. At its front end the chassis carries a support plate mounting a generally vertical pin 22 on which is swivelled a coupling member 4 for coupling a trolley 23 (Fig. 4) thereto. The coupling member 4 has a groove or channel 24, in its upper surface for receiving an end frame member 25 of the trolley 23 and disposed beneath the wheel axis. The coupling member 4 is locked to the trolley by a locking member 26, which to facilitate attachment to the trolley is resiliently biased, e.g. by a compression spring, into a locking position and which is released by means of a suitable linkage operated by a hand-operated lever (not shown) on the grip 3a of the handle or a foot pedal on the rear panel 16 of the chassis.

Two 12 volt lead acid batteries 6 connected in series and together rated at approximately 70 amp hours and delivering a current of approximately 3 to 8 amps are clamped on support brackets (not shown) mounted on the base of the chassis.

The batteries are car batteries which do not spill electrolyte when tilted up to an angle of about 45°, although the tilting angle of the driving device is considerably less.

The batteries 6 drive a reversible 24 volt DC motor 5, which drives the axle 18 and thus the wheels 9 through a transmission including a reduction gear 7, followed by a chain drive 27 and a differential unit 8. The motor 5 and gear-box 7 are appropriately supported, e.g. by brackets, from the base of the chassis. The motor is operated by a single-pole on-off switch 11, mounted on the grip 3a of the handle 3, through a contactor 12, the wires to the switch passing down the hollow interior of the handle. The switch 11 is preferably biased into the off position illustrated for safety reasons so that release of the switch stops the motor and the driving device. A double-pole reversing switch 13 and an isolation switch 13a for the motor are located on the instrument

panel 17 together with a voltmeter 14 for indicating the condition of the batteries. If an electric clutch is incorporated in the transmission to the wheels 9, the clutch is conveniently energized at the same time as the motor by the batteries through the switch 11 on the handle grip. The gear-box preferably operates in the ratio of 24:1 and the chain drive in the ratio 2:1.

The control circuitry for the battery, motor, and the clutch, if provided, is of any conventional kind, e.g. a solid state circuit. The motor is chosen to give a preferred speed for the driving device of about 2 miles per hour.

Also mounted on the chassis 1 is a battery charger 10, which is connected to the batteries and is connectible by a length of flex and suitable plug (both not visible) to a mains socket to recharge the batteries when the device is not in use. The flex is withdrawn through an opening in the front panel 15, which is normally closed, e.g. by a sliding cover plate 28. When the device is in use the plug is plugged into a dummy socket (also not visible).

The trolley shown in Fig. 4 is of tubular steel construction and is of the type currently used in department stores for transferring merchandise from store to the shopping counters. Normally the trolley is pushed or pulled manually and when fully loaded the friction between its wheels 29 and the carpetting between the shopping counters is such as to make fully loaded trolleys very difficult to move and to manoeuvre.

The device described is operated as follows. Using the steering handle as a lever, the chassis is tilted about the axis of the wheels 9 in the direction of the arrows 30 in Fig. 1 and pushed or driven towards the trolley so that the coupling member 4 is disposed beneath the end frame member 25 of the trolley. Again using the handle as a lever, the chassis is allowed to tilt in the opposite direction indicated by the arrow 31 in Fig. 1 under the influence of gravity so that the end frame member 25 is received within the groove 24 of the coupling member as shown in Fig. 4. The trolley is then driven by operating the switch 11. In order to reduce the likelihood of damage both to the driving device and e.g. shop counters in the event of an inadvertent collision, the cover 2 is preferably provided with a resilient surround 32 e.g. of rubber or plastics material which acts as a buffer.

It will be appreciated that various modifications may be made without departing from the scope of the invention as defined in the appended claims. For example, the coupling member may have another groove in its lower surface of a different size to that of the upper groove for receiving a frame member of another trolley of differ-

ent design, or alternatively, the driving device may be provided with interchangeable coupling members to achieve the same purpose. Instead of two 12 volt batteries one 12 volt battery may be used to drive a suitable 12 volt electric motor. A V-belt drive may be substituted for the chain drive and a single driven wheel be disposed between two non-driven wheels mounted to rotate on the axle. In another modification, the switch 11 is a three position switch so that in one of its positions, reversing of the motor can be effected, in which case the switch 13 may be omitted.

Further, it should be understood that the device described may have uses other than driving trolleys.

#### WHAT WE CLAIM IS:—

1. A device for driving a mobile trolley, said device comprising a chassis having front and rear ends, two ground-engaging wheels carried by said chassis and rotatable about a common axis extending transversely of said chassis, said common axis being at a location which is nearer the front end of the chassis or at the transverse centre line of said chassis, steering handle means mounted on said chassis and normally projecting beyond the rear end thereof, means for coupling a mobile trolley to said chassis, means mounting said coupling means to the front end of said chassis at a location which is low to the ground, and for swivelling about a substantially vertical axis, said device having a centre of gravity which is on that side of the wheel axis which is remote from the coupling means, battery means mounted on said chassis and an electric motor connected to the battery for driving at least one said wheels, said chassis being tiltable about the wheel axis by said handle means in one direction to position said coupling means beneath the trolley and is then tiltable in the opposite direction under the influence of gravity to engage the said coupling means with the trolley.

2. A device as claimed in claim 1, wherein said chassis has means defining a compartment therein which is nearer the rear end thereof, said battery means being disposed in said compartment.

3. A device as claimed in claim 1 or 2 wherein the coupling means comprises a coupling member having wall means defining an upwardly direction transverse channel which is adapted to receive a generally horizontal transverse end frame member of a trolley.

4. A device as claimed in any one of claims 1 to 3, including a battery charger carried by said chassis, means connecting said battery means to said battery charger and an electric cable connected at one end

to said battery charger and at its other end to an electrical plug for plugging the battery charger into a mains socket when the device is not in use for the purpose of recharging said battery means.

5 5. A device as claimed in any one of claims 1 to 4, wherein said steering handle means has an operating handle at its free end which carries switching means for the motor.

10 6. A device as claimed in claim 5, wherein the motor is a reversible motor and wherein the switch on the operating handle is a three-position switch, in one position of which the direction of rotation of the motor is reversed.

15 7. A device as claimed in any one of claims 1 to 6, including an axle which is rotatable in bearings on said chassis, said wheels being fixed to said axle, a reduction gear connection to said motor, transmission means connected to said motor and a differential connected to said axle and said transmission means.

20 8. In combination, a mobile trolley having a transverse substantially horizontal end frame member which is close to the ground, and a battery operated driving device comprising a chassis having front and rear ends, two wheels carried by said chassis and rotatable about a common axis extending transversely of said chassis, steering handle means mounted on said chassis and normally projecting beyond

the rear end thereof, coupling means projecting from the front end of said chassis and engaged with the end frame member of the trolley, said device having a centre of gravity which is on that side of the wheel axis which is remote from the coupling means and thereby urging said coupling means upwardly against the trolley end frame member, battery means mounted on said chassis and an electric motor connected to the battery means for driving at least one of said wheels, said coupling means being disengagable from the trolley end frame member by lifting the handle upwardly to tilt the chassis about the wheel axis and being re-engagable with the trolley end frame member by allowing the chassis to tilt about the wheel axis in the opposite direction under the influence of gravity.

9. A device for driving a mobile trolley, substantially as hereinbefore described with reference to Figs. 1 to 3 of the accompanying drawings.

10. The combination of a mobile trolley and a battery operated driving device substantially as hereinbefore described with reference to Fig. 4 of the accompanying drawings.

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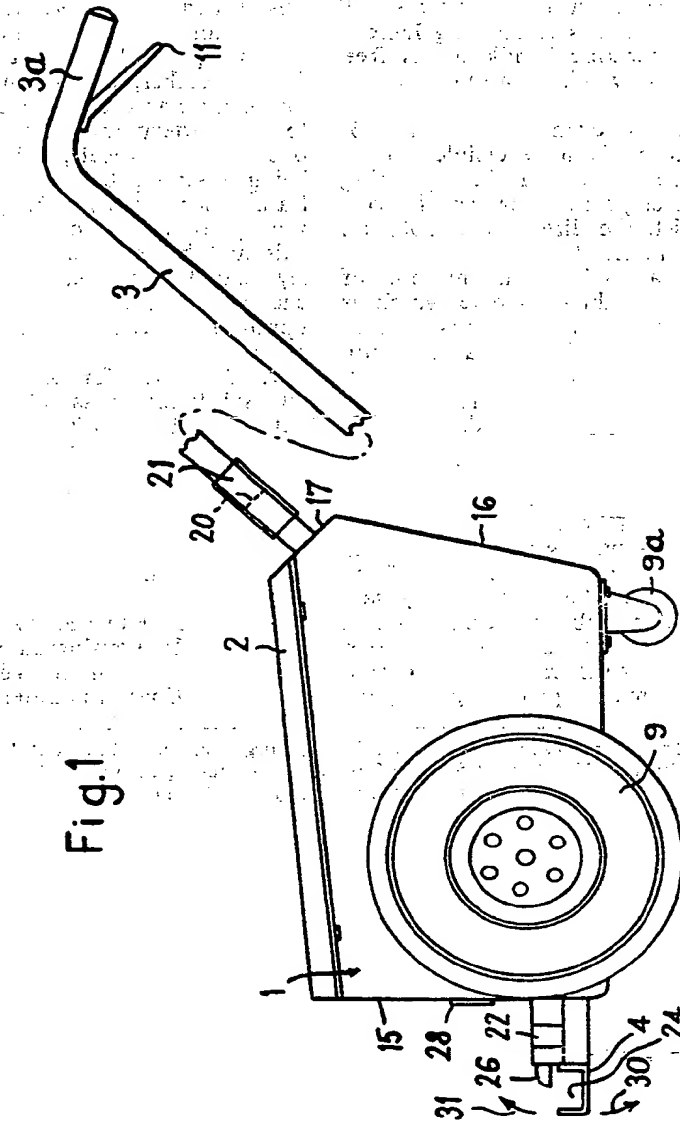
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Fig.1



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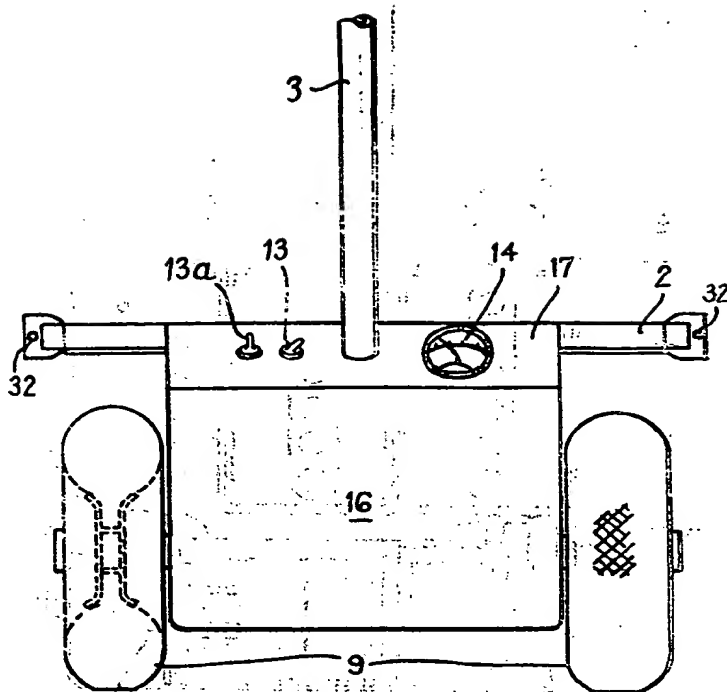
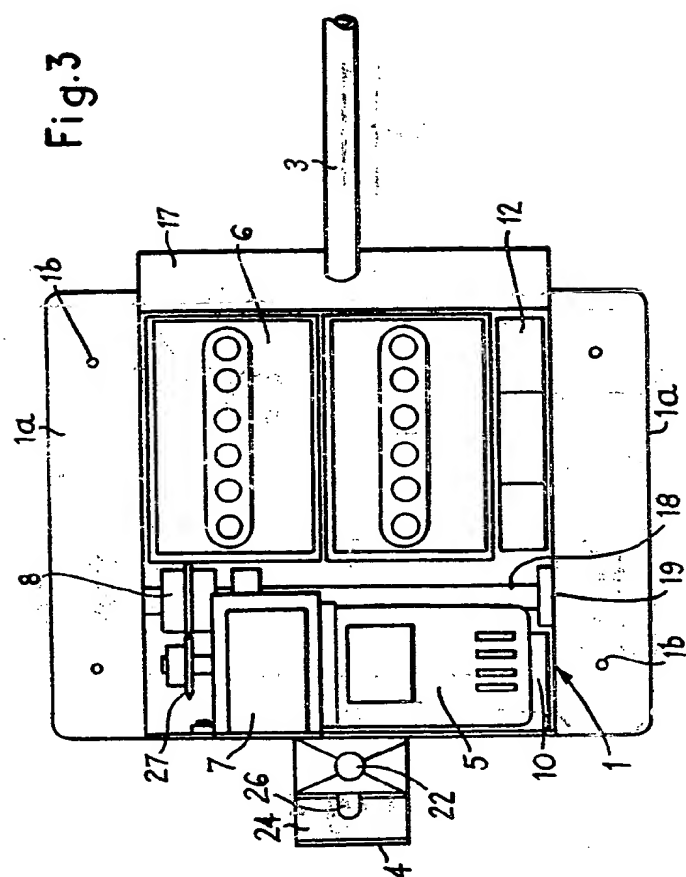


Fig. 2

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Fig.4

